

SAPC-4902
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25 April 1956

MEMORANDUM FOR THE RECORD

SUBJECT: Observations at Watertown on Photographic Equipment

During the period of 9 April through 13 April, I had an opportunity to observe during simulated operations the photographic equipment and Configurations A-1 and A-2 constructed for AQUATONE and the activities of the personnel comprising the photographic unit of Detachment A. Based upon these observations it would be my judgment that, in spite of deficiencies which are set forth in more detail below, both the equipment and the personnel now exhibit a limited operational capability which can be materially expanded by reasonable efforts directed toward equipment improvement and further personnel training. It must be noted, however, that even for this limited capability to be profitably applied competent technical representatives of the equipment manufacturers (i. e., Hycon and P & E) will be required at Base A to ensure that approved procedures are followed, that operating difficulties are recognized and overcome, and that modifications necessitated by difficulties already observed are accomplished.

EQUIPMENT

The particular equipment observed included the 6-inch focal length tri-metragon cameras produced by Hycon, the 24-inch focal length K-38 cameras (both in the rocking mode embodied in Configuration A-1 and the fixed three-camera unit comprising Configuration A-2), the charting or tracker camera produced by P & E, and the drift-sight and its associated controls.

Six-Inch Focal Length Mapping Camera:

These cameras appear to be of good design and workmanship. Two points are noteworthy. The fiducial marks can be reversed without affecting camera operation and the shutters while of proven design according to Hycon standards have not been completely checked out. On the latter point, there appears to be little reason why under proper maintenance and inspection the shutter should not function well for a reasonable lifetime.

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K-38 Camera:

The reworking of these cameras appears to have been reasonably well accomplished. However, operation of the cameras in either of the two modes of Configuration A-1 or the single mode of Configuration A-2 appears to rest largely upon the reliability of the shutters. Under present operations these shutters originally designed to operate at a maximum shutter speed of 1/150th of a second, are called upon to operate at 1/250th of a second. Hycon data indicates that, at 1/150th of a second speed, shutters can reliably be expected to function through 3,000 to 5,000 cycles; at a speed of 1/200th of a second, the same shutters can reasonably be expected to operate through 1,500 to 3,000 cycles; at 1/250th of a second, experience now indicates that even with reshing and other precautionary measures anywhere from 50 to 1,500 cycles can be expected. These data indicate that at the present shutter speed the shutters are unreliable. Since the same shutter was contemplated for incorporation in the B Configuration and operation at 1/250th of a second was also contemplated, one is forced to the conclusion that unreliability is being built into the B Configuration just as it now exists in the two A Configurations. Realizing this, Hycon recently decided to undertake a shutter redesign for B Configuration. Why this was not also done for A Configuration is not clear. In any event, from the data noted above it would appear to be essential that immediate tests be carried out in order to ascertain whether the A-1 and A-2 K-38 cameras could be operated at 1/150th of a second or even at 1/200th of a second without seriously impairing resolution. If the shutters can be operated at these speeds, a far greater degree of reliability will be achieved and operational capabilities will be materially enhanced. To alter the shutters to bring about operation at the reduced speed is merely a matter of changing the spring tension in the shutters -- a very simple procedure.

The Tracker:

This camera represents a real advance in reconnaissance photographic equipment. Several design features however will require modification in order that complete reliability can be realized. Some of these modifications are already under way such as, for example, redoing a previous modification which led to a high probability of a power short circuit through the clock mounting. The intricate relay arrangement bears re-examination. In view of the possibility that moisture conditions which can be expected in the field may well pose a serious maintenance and operation problem, hermetically sealed relays should be considered in conjunction with a standard maintenance procedure which calls for replacement after a predetermined number of

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missions. The four-second scanning period, during which power shut-off must not take place to avoid jamming the camera, presents a small problem which can be taken care of in the check-out procedure. It would be far better if some foolproof mechanism could be incorporated into the camera so that during this four-second period a power shut-off would not be effected.

The Configuration Mountings and IMC Action:

By and large the configuration mountings and the IMC drives and action are satisfactory. Several points, however, demand early attention. Small pins with finger rings are used to connect the mountings to the bulkheads to the equipment bay of the airplane. This type of mounting requires hoisting the entire configuration carefully into position so that the pin can be inserted between the bulkhead fitting and the bearing portion of the mount. This calls for a considerable amount of tagging and holding on the part of those engaged in loading the configuration into the plane in order to accurately position the mount with respect to the bulkhead fittings. While this procedure is bad enough, removal of the configuration from the plane is even worse because too much attention or too little attention on the winch cable causes the pin to be bound and removal becomes most difficult. A quick connect fitting is indicated as the required modification. On the A-2 Configuration the IMC motor is unprotected and should be covered to avoid damage while installing the configuration in the plane and removing it from the plane. Also, in connection with the A-2 Configuration, the ground handling dolly support for the forward mounting point of the configuration is a threaded screw over which the configuration is required to move. During the loading or unloading operation, the screw is bound to be damaged and will not serve its intended function of locking the configuration to the mounting point. A pin and a locking arrangement would be far better for Field use.

Periscope:

Two points must be mentioned in connection with the periscope -- modification of the present system to avoid difficulties in operation, and redesign of the present system. The following modifications of the present system appear to be essential: (a) Insulating the handle pin of the control mechanism so that short circuiting to the bail contact can not occur, and (b) incorporating an appropriate cable lock on the control cable so that when the periscope and control mechanism are operated by removing the cable from the periscope neither element can be moved so as to destroy the bore fitting alignment. Such a modification would reduce the number of bore fittings which would have to be accomplished in the Field. It is strongly

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recommended that immediate steps be taken to replace the electric mechanical control system by an electric servo system in its place. The difficulties in ensuring that too much pressure would not be applied by the pilot in coming across the pole of the electric mechanical system appear to be insurmountable. Breakage will be great and maintenance in the field difficult. The freedom of motion inherent in a mechanical servo system would avoid this difficulty. It is regrettable that training in the use of the periscope as a drift-sight was not possible as a consequence of a misunderstanding on the construction of a training stand. Such a stand has now been constructed and training of Detachment B personnel will be possible. It is suggested that such a stand be incorporated in the hangar facilities at Base A so that ground training can be carried out before operational missions are flown. The stand is a relatively inexpensive item of construction -- a few hundred dollars is involved and the benefits in northern latitudes where winds aloft may be above 50 knots would be well worth realizing.

PERSONNEL

The personnel of Detachment A in the Detachment A photographic unit are reasonably well versed in their basic duties. Strong leadership and supervision are required, however, in order to ensure that jobs are not done in a merely routine manner. Thus far, not all of the people have an appreciation of the fact that they are handling delicate and precision equipment. As a consequence, operational failures may be more frequent than necessary. While one must note that the writer's observations took place during a period of great stress and the people concerned were working at their physical limits, it appears nevertheless that until there is a full appreciation of the nature of the equipment and dedication to the accomplishment of the mission, procedures must be applied which will force the personnel involved to be extremely careful in carrying out their responsibilities. The addition of [redacted] to the Detachment A unit will unquestionably help but even this fact will not take the place of procedures which will bring about orderliness and care in the handling of the photographic equipment. The check-out procedures now being followed are not considered adequate. The question and response system should be used throughout the handling of the photographic equipment either in maintenance or in pre-flight check-out and a detailed check-out sheet should be kept. In addition, equipment is not being fully and properly tagged so that its operational status is clearly evident from the equipment

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itself without reference to a record file. At one time during the period of observation no less than six pieces of equipment were in the shop for correction of malfunctions and none of the pieces were tagged to indicate exactly what the malfunction was. If nothing else, a tagging procedure would merely be an additional step in indoctrination of personnel to orderliness and cleanliness so essential in the maintenance and operation of precision gear.

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HIM:gig (23 Apr 56)

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